

# The hymenopteran parasitoid complex (Hymenoptera, Braconidae, Eulophidae, Pteromalidae) of the pine bark beetle *Cryphalus fulvus* Niisima, 1908 (Curculionidae, Scolytinae) in South Korea

Ekaterina V. Tselikh<sup>1</sup>, Oksana V. Kosheleva<sup>2</sup>, Deok-Seo Ku<sup>3</sup>,  
Jaehyeon Lee<sup>4</sup>, Sergey A. Belokobylskij<sup>1</sup>

<sup>1</sup> Zoological Institute of the Russian Academy of Sciences, St Petersburg, Russia <sup>2</sup> All-Russian Institute of Plant Protection, St Petersburg – Pushkin, Russia <sup>3</sup> The Science Museum of the Natural Enemies, Geochang 50147, Republic of Korea <sup>4</sup> Department of Plant Medicine, Gyeongsang National University, Jinju 52828, Republic of Korea

Corresponding author: Ekaterina V. Tselikh ([tselikhk@gmail.com](mailto:tselikhk@gmail.com))

Academic editor: Ankita Gupta | Received 10 April 2025 | Accepted 23 May 2025 | Published 1 July 2025

<https://zoobank.org/6C02DD43-2ED8-4C14-BF61-DC0509902687>

**Citation:** Tselikh EV, Kosheleva OV, Ku D-S, Lee J, Belokobylskij SA (2025) The hymenopteran parasitoid complex (Hymenoptera, Braconidae, Eulophidae, Pteromalidae) of the pine bark beetle *Cryphalus fulvus* Niisima, 1908 (Curculionidae, Scolytinae) in South Korea. Journal of Hymenoptera Research 98: 637–652. <https://doi.org/10.3897/jhr.98.155465>

## Abstract

The hymenopteran parasitoid complex from the families Braconidae, Eulophidae and Pteromalidae of *Cryphalus fulvus* Niisima, 1908 (Curculionidae, Scolytinae) developing on *Pinus densiflora* Siebold & Zuccarini, 1842 are studied in the Korean Peninsula. Two new chalcidoid species, *Aprostocetus* (*Aprostocetus*) *tselikhae* Kosheleva, **sp. nov.** (Eulophidae) and *Allocricellius minutus* Tselikh, Ku & Lee, **sp. nov.** (Pteromalidae), are described and illustrated. An updated diagnosis and illustrations of the rare pteromalid monotypic genus *Sigynia* Hedqvist, 1974 are given; the type species *Sigynia ernobii* Hedqvist, 1974 is redescribed and illustrated. One species of Eulophidae, *Pediobius moldavicus* Bouček, 1965, and two species of Pteromalidae, *Rhaphitelus maculatus* Walker, 1834 and *Sigynia ernobii* Hedqvist, 1974, are reared from the larvae of *Cryphalus fulvus* for the first time. Three pteromalid genera *Allocricellius* Yang, 1996, *Rhaphitelus* Walker, 1834 and *Sigynia* Hedqvist, 1974 are recorded from Korea for the first time.

## Keywords

Chalcidoidea, Ichneumonidoidea, new host, new records, new species, taxonomy



## Introduction

The pine bark beetle *Cryphalus fulvus* Niisima, 1908 (Coleoptera, Curculionidae, Scolytinae) (Figs 1, 2) is a pest of conifers distributed in China (North-east, Taiwan), Japan and Korea (Beaver and Liu 2010). The hymenopteran parasitoids of this bark beetle are rather poorly studied. Only the braconid *Sycosoter hattorii* (Kono & Watanabe, 1935) and the pteromalid *Roptrocercus xylophagorum* (Ratzeburg, 1844) have been already known as the primary ectoparasitoids of the larvae of *C. fulvus* (Watanabe 1948; Kamiyo 1981; Belokobylskij 2009; Belokobylskij et al. 2024).

This paper presents the results of our study of the hymenopteran parasitoid complex from the families Braconidae, Eulophidae and Pteromalidae of *Cryphalus fulvus* Niisima, 1908 developing on *Pinus densiflora* Siebold & Zuccarini, 1842 in South Korea. Here, we have compiled a comprehensive checklist of parasitoids associated with *C. fulvus* and revealed new trophic relationships. Some specimens were found to belong to a new species and are described here. Three pteromalid genera were recorded for the first time from Korea.

## Material and methods

The material (including type specimens) used for this study is deposited in the Hymenoptera collections of the National Institute of Biological Resources, Incheon, Republic of Korea (**NIBR**), the Science Museum of the Natural Enemies, Geochang, Republic of Korea (**SMNE**), Hokkaido University Museum, Sapporo, Japan (**EIHU**), Naturhistoriska Riksmuseet, Stockholm, Sweden (**NHRS**), and the Zoological Institute of the Russian Academy of Sciences, St Petersburg, Russia (**ZISP**).

This study was carried out in South Korea in the administrative regions of Gyeong-sangnam-do and Gyeongsangnam-do, where *Cryphalus fulvus* outbreaks occurred. The late instar larvae (IV–VI) and cocoons with pupae of *Cryphalus fulvus* found in the branches and trunks of conifers were collected in June and July to obtain the parasitoids associated with the larvae and pupae of the pest. For this purpose, the pine logs at least 40 cm length were cut in the forest (Fig. 3). The ends of the logs were coated with plasticine to prevent moisture loss (Fig. 4). The wood samples were placed in dark bags with transparent collectors (plastic cylinders) at the ends (Fig. 5). The collected larvae, and pupae of bark beetles were maintained in the laboratory under stable conditions:  $26 \pm 2$  °C air temperature, 60–70% relative humidity. The reared parasitoids were removed from transparent collectors, mounted on entomological cards with pins and used for morphological identification.

Morphological terminology, including sculpture and wing venation nomenclature, follows Graham (1987), Bouček and Rasplus (1991), Gibson (1997) and Burks et al. (2022). The following abbreviations are used: **POL** – posterior ocellar line, the minimum distance between the posterior ocelli; **OOL** – ocello-ocular line, the minimum distance between a posterior ocellus and compound eye; **F1–F5** – funicular segments; **C1–C4** – claval segments; **SLG** – sublateral groove of scutellum; **SMG** – submedian groove of scutellum; **SM** – submarginal vein; **M** – marginal vein; **S** – stigmal vein;





**Figures 1–5.** Adult of *Cryphalus fulvus* Niisima, 1908 (**1, 2**) **1** body, lateral view **2** body, dorsal view. Method for rearing pteromalids from infected xylobionts (**3–5**) **3** cutting logs in the forest **4** non-drying plasticine at the ends of the logs **5** dark bags with transparent collectors at the ends.



**PM** – postmarginal vein; **Mt1** – petiole of metasoma; **Mt2–Mt8** – metasomal tergites (**Mt1** – petiole). The scape is measured without the radicle; the pedicel is measured in lateral view. The distance between the clypeal lower margin and the toruli is measured from the lower margins of the toruli. Eye height is measured as its maximum diameter, eye length as a minimum diameter. The mesosoma and metasoma are measured in lateral view, the latter including the ovipositor sheath.

## Results

According to our study and the previously published data (Watanabe 1948; Kamijo 1981; Belokobylskij 2009; Belokobylskij et al. 2024), the parasitoids associated with *Cryphalus fulvus* Nijima included seven species from three families: *Sycosoter hattorii* (Kono & Watanabe, 1935) (Braconidae); *Aprostocetus* (*Aprostocetus*) *tselikhae* Koshel'eva, sp. nov. and *Pediobius moldavicus* Bouček, 1965 (Eulophidae); *Allocricellius minutus* Tselikh, Ku & Lee, sp. nov., *Rhaphitelus maculatus* Walker, 1834, *Roptrocercus xylophagorum* (Ratzeburg, 1844) and *Sigynia ernobii* Hedqvist, 1974 (Pteromalidae).

New data on biological relationships were obtained, one species of Eulophidae, *Pediobius moldavicus* Bouček, 1965, and two species of Pteromalidae, *Rhaphitelus maculatus* Walker, 1834 and *Sigynia ernobii* Hedqvist, 1974, are reared for the first time from the larvae of *Cryphalus fulvus*.

Three pteromalid genera *Allocricellius* Yang, 1996, *Rhaphitelus* Walker, 1834 and *Sigynia* Hedqvist, 1974 are recorded for the first time in the fauna of the Korean peninsula.

## Taxonomy

**Family Braconidae Nees, 1811**

**Subfamily Doryctinae Foerster, 1963**

**Tribe Ecphylini Hellén, 1957**

**Genus *Sycosoter* Picard & Lichtenstein, 1917**

***Sycosoter hattorii* (Kono & Watanabe, 1935)**

Fig. 17

*Ecphylus hattorii* Kono & Watanabe, 1935: 68. Holotype female (EIHU, examined).

*Sycosoter hattorii*: Belokobylskij and Lin 2020: 31; Belokobylskij et al. 2024: 352.

**Material examined. Other material:** SOUTH KOREA • 4 ♀♀, 6 ♂♂; **Gyeongsangnam-do**, Geochang-gun, Namsang-myeon, Jeoncheok-ri, on *Pinus densiflora* Siebold & Zucc., 35°37'15.3"N, 127°57'51.4"E, 13.VI.2022 (coll.), 15.VII.2022 (ex.), 21.VII.2022 (ex.), coll. E. Tselikh, J. Lee, S. Belokobylskij; (SMNE) • 47 ♀♀, 15 ♂♂; same label, 22.VI.2023; (ZISP) • 1 ♀; Goseong-gun, Jangpal-ri, 35°40'123"N, 127°53'17.8"E, reared from *Cryphalus fulvus* Niisima, 1908 on *Pinus densiflora* Siebold & Zucc., 1.VII.2023, coll. E. Tselikh, J. Lee, S. Belokobylskij; (ZISP).



**Distribution.** Taiwan, Japan, South Korea; Russia (south of Far East) (Belokobylskij et al. 2024).

**Biology.** Reared from larvae of *Cryphalus piceus* Eggers, 1926 and *C. fulvus* Nisima, 1908 (Curculionidae, Scolytidae).

**Family Eulophidae Westwood, 1829**

**Subfamily Tetrastichinae Foerster, 1856**

**Genus *Aprostocetus* Westwood, 1833**

**Subgenus *Aprostocetus* Westwood, 1833**

*Aprostocetus (Aprostocetus) tselikhae* Kosheleva, sp. nov.

<https://zoobank.org/DCE59B6D-E082-4114-9D74-8AE9392D4383>

Figs 6–16

**Comparative diagnosis.** *Aprostocetus tselikhae* sp. nov. is similar to *A. crypturgus* Yang, 1996 because they have a F1  $1.62\text{--}1.64\times$  as long as pedicel; scutellum with distance between SMG equal distance SMG to SLG; ovipositor sheath projecting by  $0.1\text{--}0.2$  length of Mt8. However, *A. tselikhae* sp. nov. have the anterior pair of setae clearly visible behind the middle of scutellum (vs. in the middle); clava  $2.37\times$  as long as broad (vs.  $2.7\times$ ); not visible articulations between claval segments (vs. visible); funicle with straight longitudinal sensillae (vs. twisted); gaster  $1.96\text{--}2.25\times$  as long as broad (vs.  $2.7\times$ ).

**Description. Female.** Body length  $1.63\text{--}1.88$  mm; fore wing length  $1.26\text{--}1.31$  mm.

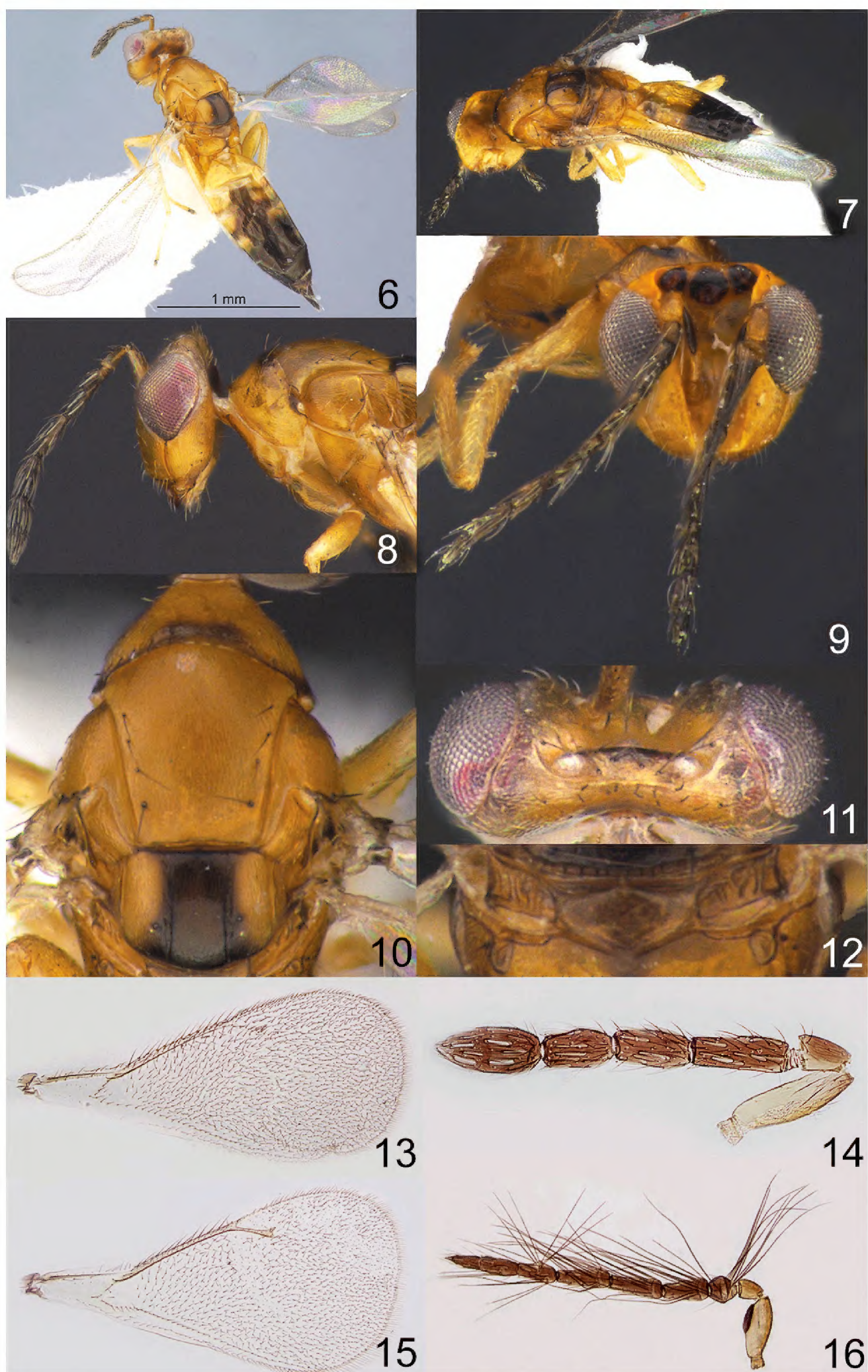
**Coloration.** Head with areas around ocellus and occiput yellowish brown. Antenna with scape and pedicel reddish yellow, flagellum dark brown. Posterior margin of pronotum, median part of scutellum, dorsellum, median part of propodeum and metasoma from brownish-black to fuscous. All legs yellow. Tegulae brown; wings hyaline, venation pale yellow.

**Sculpture.** Mesoscutum moderately shiny, with delicate superficial reticulation; propodeum shiny with smooth engraved reticulation; metasoma with Mt2–Mt4 smooth, Mt5–Mt6 alutaceous.

**Head.** Head in dorsal view  $2.42\times$  as broad as long and  $1.05\text{--}1.13\times$  as broad as mesosoma, in frontal view  $1.15\times$  as broad as height. POL  $1.67\times$  OOL; OOL  $2\times$  OD. Face medially concave. Malar space  $0.58\text{--}0.6\times$  as long as eye height; malar sulcus moderately curved. Mouth  $1.42\text{--}1.45\times$  as wide as height of malar space. Antenna with scape  $0.8\times$  as long as eye height;  $3.56\times$  as long as broad and reaching of median ocellus; combined length of pedicel and flagellum  $1.34\text{--}1.41\times$  breadth of head;  $1.5\text{--}1.53\times$  breadth of mesoscutum; pedicel  $1.75\times$  as long as broad and  $0.57\times$  as long as F1; funicle proximally not stouter than pedicel; F1  $3\text{--}3.25\times$ , F2  $2.22\text{--}2.4\times$ , F3  $1.67\text{--}2\times$  as long as broad. Clava slightly broader than F3;  $0.76\text{--}0.78\times$  as long as F2–F3 and  $2.37\times$  as long as broad; articulation of claval segments not visible.

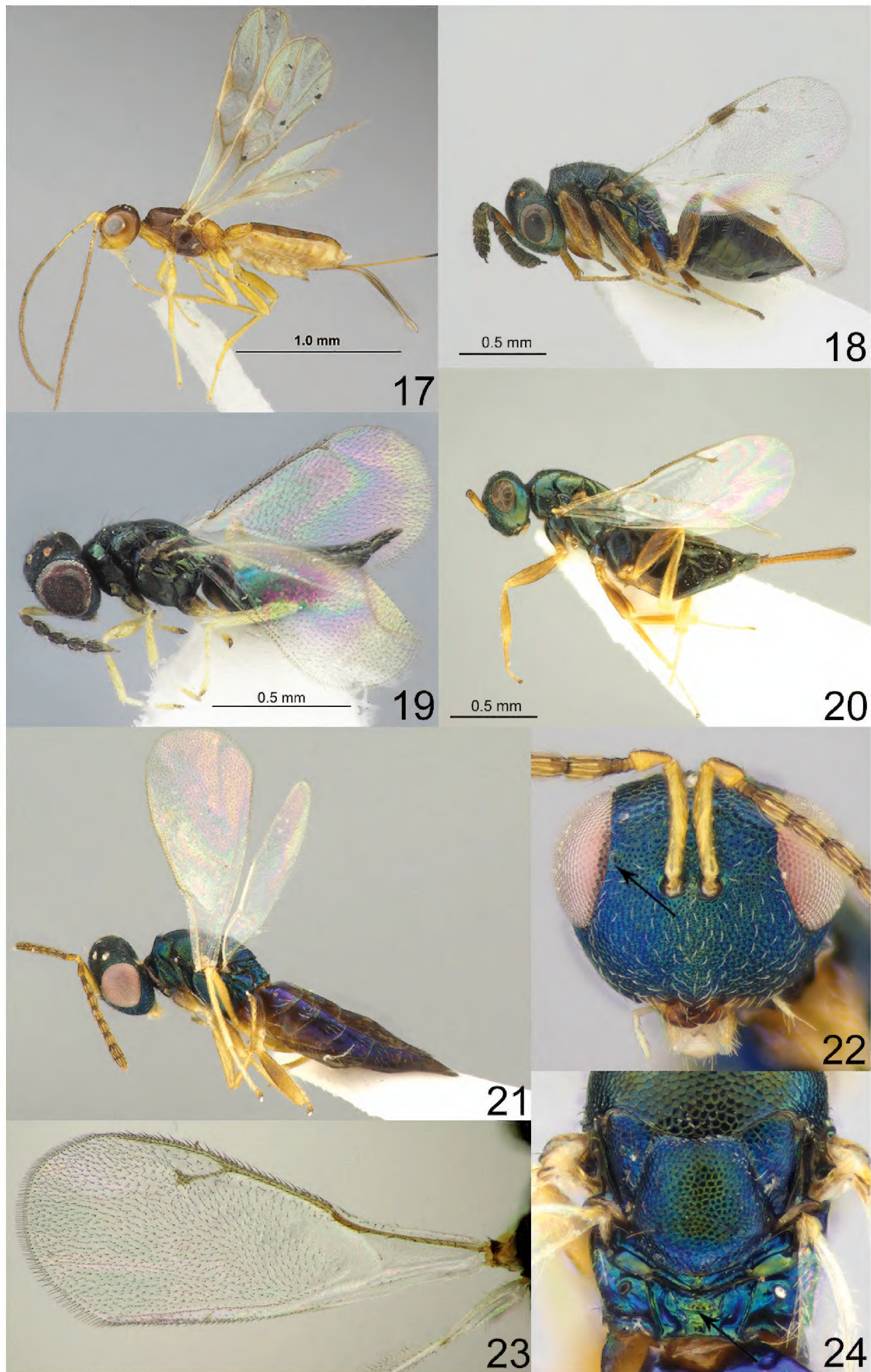
**Mesosoma.** Mesosoma in dorsal view  $1.53\times$  as long as broad. Pronotum medially  $0.3\text{--}0.42\times$  as long as mesoscutum. Mid lobe of mesoscutum  $1.07\times$  as broad as long; median line fine but traceable in some lights, with 4 adnotaular setae on each side. Scutellum  $0.62\times$  as long as mid lobe of mesoscutum,  $1.32\times$  as broad as long;





**Figures 6–16.** *Aprostocetus (Aprostocetus) tselikhae* Kosheleva, sp. nov., holotype female (**6–14**) **6, 7** body, dorso-lateral view **8** antenna, head and part of mesosoma, lateral view **9** head, frontal view **10** mesosoma, dorsal view **11** head, dorsal view **12** propodeum, dorsal view **13** fore wing **14** antenna. Paratype male (**15, 16**) **15** fore wing **16** antenna.





**Figures 17–24.** *Sycosoter hattorii* (Kono & Watanabe, 1935), not type female (17); *Rhaphitelus maculatus* Walker, 1834 (18); *Pediobius moldavicus* Bouček, 1965 (19); *Roptrocerus xylophagorum* (Ratzeburg, 1844) (20); *Allocricellius armandii* Yang, 1996 (21–24). 17–21 Body, lateral view 22 head, frontal view 23 fore wing 24 and scutellum and propodeum, dorsal view.



distance between SMG equal distance SMG to SLG, enclosing space  $2.29 \times$  as long as broad; have the anterior pair of setae clearly visible behind the middle of scutellum; distance between anterior pair of setae and front edge of scutellum  $2 \times$  distance between anterior and posterior pair of setae. Dorsellum  $0.37 \times$  as long as scutellum and  $2 \times$  as broad as long. Propodeum medially as long as dorsellum; median carina distinct; callus with 4 setae. Legs slender; hind femur  $3.13 \times$  as long as broad; spur of mid tibia as long as basitarsus. Fore wing  $1.96\text{--}2.1 \times$  as long as broad; costal cell  $0.71 \times$  length of M,  $12.5 \times$  as long as broad; SM with 4 dorsal setae; M  $3.5 \times$  length of S, its front edge with 13 setae; ST thin proximally, expanding gradually forming rather indistinct stigma; PM rudimentary; speculum small, not extending below M; cilia  $0.3 \times$  length of S. Hind wing obtuse; cilia  $0.26 \times$  breadth of wing.

**Metasoma.** Metasoma  $1.33\text{--}1.5 \times$  as long as mesosoma;  $1.09\text{--}1.18 \times$  as long as head and mesosoma combined. Gaster longitudinal-oval,  $1.96\text{--}2.25 \times$  as long as broad, acuminate; its last tergite as long as broad; ovipositor sheath projecting by  $0.1$  length of Mt8; cerci with one pair of setae  $2 \times$  as long as second pair, slightly curved; tip of hypopygium at  $0.51\text{--}0.6$  length of gaster.

**Male.** Body length 1.53 mm; fore wing length 1.26 mm. Mid lobe of mesoscutum  $1.04 \times$  as long as broad; with 3 adnotaular setae on each side. Antenna with scape  $2.14 \times$  as long as broad, with ventral plaque  $0.53$  length of scape; combined length pedicel and flagellum  $2.19 \times$  breadth of mesoscutum; pedicel  $1.56 \times$  as long as broad, and as long as F1; F1 quadrate, F2  $2.2 \times$  as long as broad, F3 and F4  $2.6 \times$  as long as broad; clava  $1.07 \times$  as long as F3–F4,  $7 \times$  as long as broad, with C1 and C2 subequal and  $2.5 \times$  as long as broad; C3 slightly shorter; whorled setae long. Metasoma as long as mesosoma,  $0.78 \times$  as long as head and mesosoma combined; gaster  $1.89 \times$  as long as broad. Otherwise, similar to female.

**Etymology.** The species is named in honour of the Russian hymenopterist, expert of Pteromalidae, and main collector of the types, Dr Ekaterina V. Tselikh (ZISP).

**Type material.** *Holotype*: SOUTH KOREA • ♀; **Gyeongsangnam-do**, Sancheong-gun, Chahwang-myeon, Silmae-ri,  $35^{\circ}29'39''\text{N}$ ,  $127^{\circ}56'30''\text{E}$ , reared from *Cryphalus fulvus* Niisima, 1908 on *Pinus densiflora* Siebold & Zucc., 22.VII.2024, coll. E. Tselikh, J. Lee; (NIBR). *Paratypes*: SOUTH KOREA • 1 ♀, 1 ♂; same label as holotype, antenna of female – permanent slide no. 123; antenna and fore wing of male – permanent slide nos 124 and 126; (ZISP).

**Distribution.** Republic of Korea.

**Biology.** Ectoparasitoids of larvae of the bark beetle *Cryphalus fulvus* Niisima (Curculionidae, Scolytinae) developing on *Pinus densiflora*.

## Subfamily Entedoninae Foerster, 1856

### Genus *Pediobius* Walker, 1846

#### *Pediobius moldavicus* Bouček, 1965

Fig. 19

*Pediobius moldavicus* Bouček, 1965: 39. Holotype female (Narodni Muzeum v Praze, Prague, not examined).



**Material examined. Other material:** SOUTH KOREA • 1 ♀; **Gyeongsangnam-do**, Sancheong-gun, Chahwang-myeon, Silmae-ri, 35°29'39"N, 127°56'30"E, reared from *Cryphalus fulvus* Niisima, 1908 on *Pinus densiflora* Siebold & Zucc., 22.VII.2024, coll. E. Tselikh and J. Lee; (ZISP).

**Distribution.** Moldova, Poland (Bouček 1965; UCD Community 2025), Japan, Republic of Korea (Kamijo 1979), Russia (Kosheleva 2023).

**Biology.** Primary ectoparasitoids of larvae of the bark beetle *Cryphalus fulvus* Niisima (Curculionidae, Scolytinae) (new host) developing on *Pinus densiflora*.

**Family Pteromalidae Dalman, 1820**

**Subfamily Pteromalinae Dalman, 1820**

**Genus *Allocricellius* Yang, 1996**

***Allocricellius minutus* Tselikh, Ku & Lee, sp. nov.**

<https://zoobank.org/04976E8D-3D5A-48A5-87D8-231540A3A35C>

Figs 25–31

**Comparative diagnosis.** *Allocricellius minutus* sp. nov. is similar to *A. armandii* Yang, 1996 (Figs 21–24) because they have a face with small tubercle on the inner orbit (Figs 22, 26); the head in dorsal view is  $2\text{--}2.12 \times$  as broad as long (as in Fig. 28); propodeum with a transverse carina (Figs 24, 30) and reticulate clypeus (Figs 22, 26). However, *A. minutus* has POL  $2\text{--}2.2 \times$  as long as OOL (vs. POL  $2.41\text{--}2.6 \times$  as long as OOL); fore wing with M  $1.8\text{--}1.9 \times$  as long as S (Fig. 29) (vs. M  $2.2\text{--}2.45 \times$  as long as S: Fig. 23); hind femur dark brown with metallic blue green lustre (Fig. 25) (vs. hind femora yellow-brown: Fig. 21).

**Description. Female.** Body length 1.17–1.9 mm; fore wing length 1.3–1.5 mm.

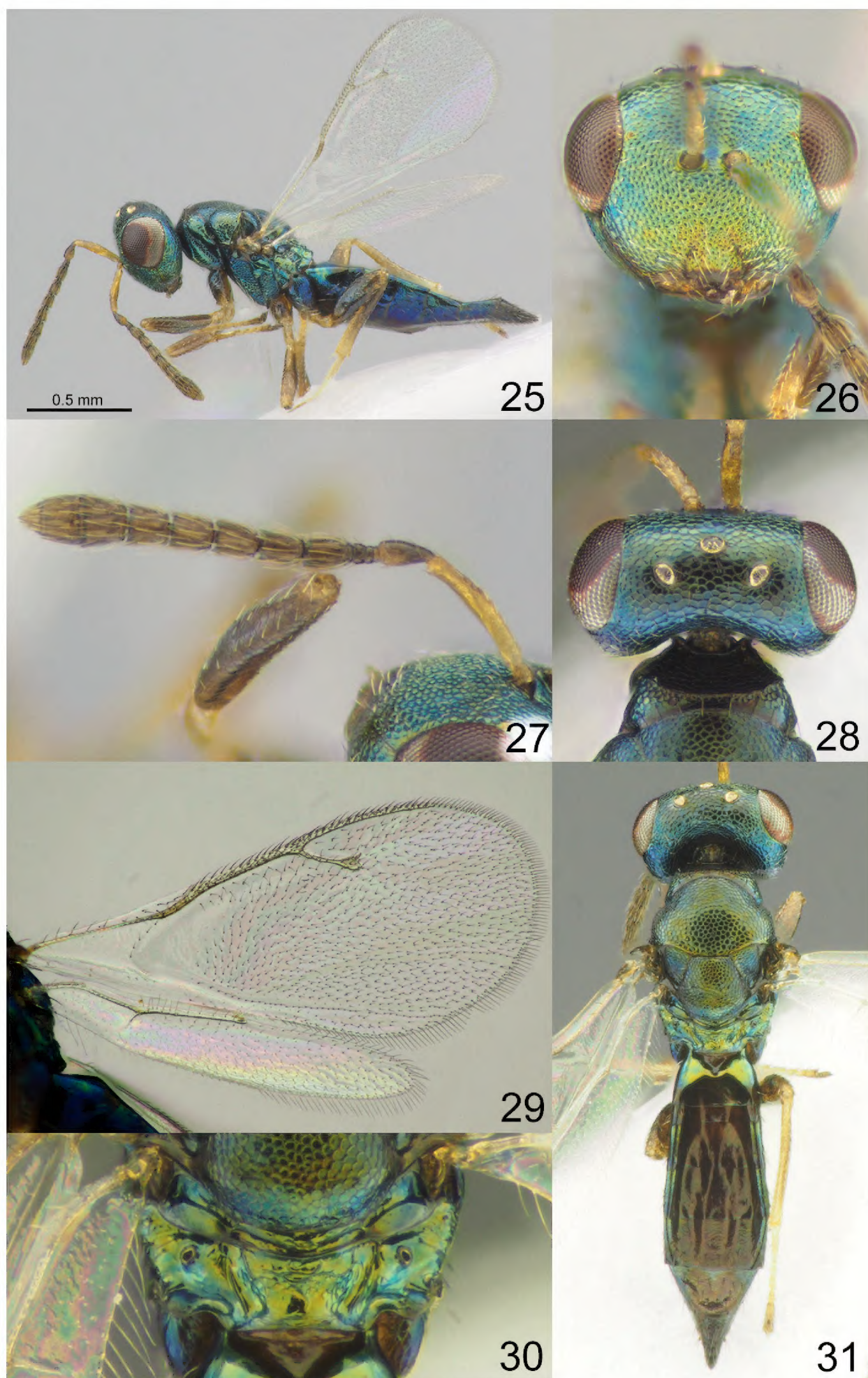
**Colour.** Head and mesosoma blue green with metallic diffuse coppery lustre; antenna with scape yellowi-brown; pedicel, anelli, F1–F6 and clava brown. Fore and hind coxae dark blue with metallic violet lustre, mid coxa brown; all femora dark brown, all tibiae brown, all tarsi yellow-brown. Fore wing hyaline, venation brown. Metasoma dorsally dark brown with metallic green and coppery lustre; ovipositor sheath brown.

**Sculpture.** Head, clypeus and mesosoma reticulate; propodeum alutaceous; petiole smooth; metasoma smooth and shiny.

**Head.** Head in dorsal view  $2\text{--}2.06 \times$  as broad as long and  $1.26\text{--}1.3 \times$  as broad as mesoscutum; in frontal view  $1.2\text{--}1.3 \times$  as broad as high. POL  $2\text{--}2.2 \times$  as long as OOL. Eye height  $1.08\text{--}1.11 \times$  eye length and  $1.49\text{--}1.57 \times$  as long as malar space. Distance between antennal toruli and lower margin of clypeus  $1.18\text{--}1.25 \times$  distance between antennal toruli and median ocellus. Antenna with scape  $0.92\text{--}0.93 \times$  as long as eye height and  $1\text{--}1.03 \times$  as long as eye length; pedicel  $1.9\text{--}2.0 \times$  as long as broad; combined length of pedicel and flagellum  $1.09\text{--}1.1 \times$  breadth of head; F1–F6 longer than broad, F1  $1.4\text{--}1.6 \times$  as long as broad and with 1 row of sensilla; clava  $2.16\text{--}2.2 \times$  as long as broad, with small micropilose area on each C3 and C4. Lower margin of clypeus bidentate.

**Mesosoma.** Mesosoma  $1.46\text{--}1.52 \times$  as long as broad. Scutellum moderately arched, as long as broad, frenal area not distinct by sculpture. Propodeum  $0.38\text{--}0.42 \times$  as long as scutellum, without costula, median carina and nucha, with irregular





**Figures 25–31.** *Allocricellius minutus* Tselikh, Ku & Lee, sp. nov., holotype female **25** body, lateral view **26** head, frontal view **27** antenna **28** head and pronotum, dorsal view **29** wings **30** propodeum, dorsal view **31** body, dorsal view.



transverse carina. Fore wing  $2.3\text{--}2.5 \times$  as long as its maximum width; basal cell with 0–3 setae; basal vein pilose; speculum open below; M  $0.85\text{--}0.93 \times$  as long as PM and  $1.82\text{--}1.92 \times$  as long as S; stigma small.

**Metasoma.** Metasoma  $3.1\text{--}3.15 \times$  as long as broad,  $1.68\text{--}1.73 \times$  as long as mesosoma,  $1.18\text{--}1.22 \times$  as long as mesosoma and head combined. Petiole transverse. Ovipositor sheath projecting slightly beyond apex of metasoma.

**Male.** Body length 1.6–1.7 mm; fore wing length 1.2–1.4 mm. Distance between antennal toruli and lower margin of clypeus  $1.3\text{--}1.55 \times$  distance between antennal toruli and median ocellus. Combined length of pedicel and flagellum  $1.26\text{--}1.29 \times$  breadth of head; clava  $2.9\text{--}3.2 \times$  as long as broad. Metasoma  $2.22\text{--}2.33 \times$  as long as broad,  $1.11\text{--}1.19 \times$  as long as mesosoma,  $0.8\text{--}0.84 \times$  as long as mesosoma and head. Otherwise similar to female.

**Etymology.** From the Latin «minutus» (= small), referring to the small size of body of this species.

**Material examined. Holotype:** SOUTH KOREA • ♀; **Gyeongsangnam-do**, Geochang-gun, Namsang-myeon, Jeoncheok-ri,  $35^{\circ}37'15.3''\text{N}$ ,  $127^{\circ}57'51.4''\text{E}$ , reared from *Cryphalus fulvus* Niisima on *Pinus densiflora* Siebold & Zucc., 22.VI.2024, coll. E. Tselikh, J. Lee; (NIBR). **Paratypes:** SOUTH KOREA • 5 ♀♀, 6 ♂♂; **Gyeongsangnam-do**, Geochang-gun, Namsang-myeon, Jeoncheok-ri,  $35^{\circ}37'15.3''\text{N}$ ,  $127^{\circ}57'51.4''\text{E}$ , reared from *Cryphalus fulvus* Niisima on *Pinus densiflora* Siebold & Zucc., 11–13.VI.2022 and 22.VI.2023, coll. E. Tselikh, J. Lee, S. Belokobylskij; (ZISP) • 2 ♀♀, Geochang-gun, Mari-myeon, Yeongseung-ri,  $35^{\circ}42'51''\text{N}$ ,  $127^{\circ}52'34''\text{E}$ , 06.VII.2023, coll. E.V. Tselikh; (ZISP) • 5 ♀♀, 5 ♂♂; Sancheong-gun, Chahwang-myeon, Silmae-ri,  $35^{\circ}29'39''\text{N}$ ,  $127^{\circ}56'30''\text{E}$ , reared from *Cryphalus fulvus* Niisima on *Pinus densiflora* Siebold & Zucc., 22.VII.2024, coll. E. Tselikh, J. Lee; (SMNE, ZISP) • 2 ♀♀, Daegu, Dalseong-gun, Yang-ri,  $35^{\circ}42'48''\text{N}$ ,  $128^{\circ}30'41''\text{E}$ , 9.VIII.2024, coll. E. Tselikh; (SMNE).

**Distribution.** South Korea.

**Biology.** Primary ectoparasitoids of the larvae of *Cryphalus fulvus* Niisima (Curculionidae, Scolytinae) developing on *Pinus densiflora*.

**Remarks.** The genus *Allocricellius* Yang, 1996 is here recorded for the first time for the Korean Peninsula.

## Genus *Roptrocerus* Ratzeburg, 1848

### *Roptrocerus xylophagorum* (Ratzeburg, 1844)

Fig. 20

*Pachyceras xylophagorum* Ratzeburg, 1844: 218. Type presumed lost.

**Note.** For synonymy and citations, see UCD Community (2025).

**Material examined. Other material:** SOUTH KOREA • 1 ♀; **Gyeongsangnam-do**, Geochang-gun, Namsang-myeon, Jeoncheok-ri,  $35^{\circ}37'15.3''\text{N}$ ,  $127^{\circ}57'51.4''\text{E}$ , reared from *Cryphalus fulvus* Niisima on *Pinus densiflora* Siebold & Zucc., 11–13.VI.2022, coll. E. Tselikh, J. Lee, S. Belokobylskij; (NIBR).



**Distribution.** Australia, Austria, Belgium, Bosnia and Herzegovina, Bulgaria, Canada, China, Croatia, Czech Republic, Finland, France, Georgia, Germany, Greece, Guatemala, Hungary, Israel, Italy, Japan, Kazakhstan, Lithuania, Mexico, Netherlands, Norway, Poland, South Korea (new record), Romania, Russia, Spain, Sweden, Switzerland, United Kingdom, USA (Tselikh 2010, 2019; UCD Community 2025).

**Biology.** Primary ectoparasitoids of beetles from the subfamily Scolytinae (Curculionidae), including *Cryphalus fulvus* Niisima (Kamijo 1981; UCD Community 2025).

### Genus *Rhaphitelus* Walker, 1834

#### *Rhaphitelus maculatus* Walker, 1834

Fig. 18

*Rhaphitelus maculatus* Walker, 1834: 179. Holotype female (Natural History Museum, London, not examined).

**Note.** For synonymy, see UCD Community (2025).

**Material examined. Other material:** SOUTH KOREA • 1 ♀; **Gyeongsangnam-do**, Geochang-gun, Namsang-myeon, Jeoncheok-ri, 35°37'15.3"N, 127°57'51.4"E, reared from *Cryphalus fulvus* Niisima on *Pinus densiflora* Siebold & Zucc., 22.VI.2023, coll. E. Tselikh, J. Lee, S. Belokobylskij; (NIBR).

**Distribution.** Argentina, Australia, Belgium, Bulgaria, Canada, Chile, China, Croatia, Czech Republic, Egypt, England, France, Georgia, Germany, Hungary, India, Iran, Israel, Italy, Japan, Kazakhstan, Moldova, Netherlands, New Zealand, Poland, Republic of Korea (new record), Romania, Russia, Serbia, Slovakia, Spain, Sweden, Tajikistan, Tunisia, Turkey, Ukraine, United Kingdom, USA, Uzbekistan (Tselikh 2010, 2019; UCD Community 2025).

**Biology.** Primary ectoparasitoids of beetles from the subfamily Scolytinae (Curculionidae); possible secondary parasitoids of Braconidae (UCD Community 2025). The bark beetle *Cryphalus fulvus* Niisima is reported as a host for *Rhaphitelus maculatus* Walker for the first time.

**Remarks.** The genus *Rhaphitelus* Walker, 1834 is recorded here for the first time for the Korean Peninsula.

### Genus *Sigynia* Hedqvist, 1974

*Sigynia* Hedqvist, 1974: 53. Type species *Sigynia ernobii* Hedqvist, 1974, by original designation and monotypy.

**Diagnosis.** Head without occipital carina (Fig. 35). Gena without malar depression; genal lamina absent (Fig. 34). Clypeal margin slightly produced and subtruncate (Fig. 37). Antennal formula 11264 (Fig. 32); flagellum short and slightly clavate; area of micropilosity small and extending C3–C4 (Fig. 32). Antenna inserted above lower ocular line;



antennal protuberance small; scrobes shallow (Fig. 33). Pronotum short with collar not carinate (Fig. 39); notauli not complete (Fig. 39); prepectus longer than tegula. Mesoscutum and scutellum flat (Fig. 34). Propodeum reticulate with median carina and plicae; costula and nucha absent; propodeal spiracle inserted close to anterior propodeal margin (Fig. 39). Fore wing hyaline, with closed speculum; M not widened and longer than S and P (Fig. 36). Hind coxa dorsally bare. Petiole in dorsal view smooth and transverse (Fig. 39). Cerci with setae subequal in length, ovipositor shortly protruding.

**Remarks.** This is a small, poorly represented genus, previously found only in the Czech Republic and Sweden (Hedqvist 1974; Bouček and Rasplus 1991) and recorded here for the first time for the East Palaearctic. The original descriptions of the genus and species are incomplete, and high-quality illustrations have not been published.

### *Sigynia ernobii* Hedqvist, 1974

Figs 32–39

*Sigynia ernobii* Hedqvist, 1974: 53. Holotype female (NHRS, examined).

**Redescription. Female.** Body length 2.00–2.50 mm; fore wing length 1.40–1.90 mm.

**Coloration.** Head and mesosoma black with metallic diffuse blue and coppery lustre; clypeus black with metallic diffuse green and coppery lustre; antenna with scape brown, pedicel, anelli, F1–F6 and clava dark brown. All coxae black; all femora and tibiae brown, all tarsi yellowish brown. Fore wing hyaline, venation brown. Metasoma dorsally dark brown with metallic coppery lustre; ovipositor sheaths brown.

**Sculpture.** Head, clypeus, mesosoma and propodeum reticulate; petiole smooth; metasoma smooth and shiny.

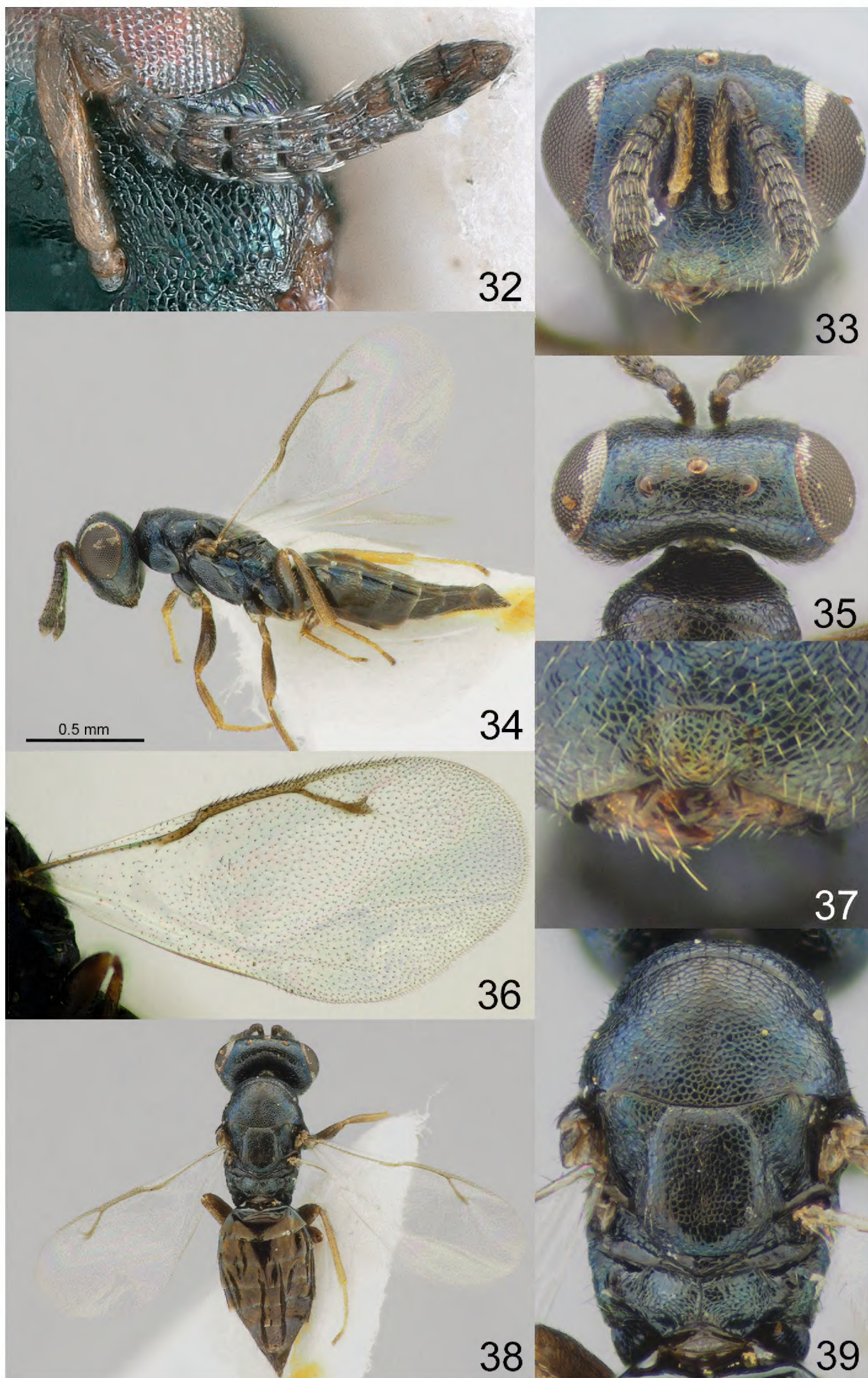
**Head.** Head in dorsal view  $2.14\text{--}2.17 \times$  as broad as long and  $1.18\text{--}1.27 \times$  as broad as mesoscutum; in frontal view  $1.32\text{--}1.38 \times$  as broad as high. POL  $2.40\text{--}2.46 \times$  as long as OOL. Eye height  $1.17\text{--}1.29 \times$  eye length and  $1.89\text{--}2.09 \times$  as long as malar space. Distance between antennal toruli and lower margin of clypeus  $0.6\text{--}0.64 \times$  distance between antennal toruli and median ocellus. Antenna with scape  $0.77\text{--}0.79 \times$  as long as eye height and  $0.93\text{--}1 \times$  as long as eye length; pedicel  $1.9\text{--}2 \times$  as long as broad; combined length of pedicel and flagellum  $0.77\text{--}0.79 \times$  breadth of head; F1–F6 transverse, F1  $0.8\text{--}0.85 \times$  as long as broad and with 1 rows of sensilla; clava  $2\text{--}2.09 \times$  as long as broad, with small micropilose area on each C3 and C4. Lower margin of clypeus subtruncate.

**Mesosoma.** Mesosoma  $1.43\text{--}1.55 \times$  as long as broad. Scutellum flat,  $1.05\text{--}1.2 \times$  as long as broad, frenal area weakly visible by sculpture. Propodeum  $0.39\text{--}0.43 \times$  as long as scutellum, with median carina and plicae, without costula and nucha. Fore wing  $2.23\text{--}2.24 \times$  as long as its maximum width; basal cell partly pilose; basal vein pilose; speculum closed below; M  $1.04\text{--}1.07 \times$  as long as PM and  $1.37\text{--}1.46 \times$  as long as S; stigma small.

**Metasoma.** Metasoma  $1.73\text{--}1.97 \times$  as long as broad,  $1.46\text{--}1.49 \times$  as long as mesosoma,  $1\text{--}1.11 \times$  as long as mesosoma and head. Ovipositor sheath projecting slightly beyond apex of metasoma.

**Male.** Unknown.





**Figures 32–39.** *Sigynia ernobii* Hedqvist, 1974, holotype female (**32**) **32** antenna. Not type female (**33–39**) **33** head, frontal view **34** body, lateral view **35** head and pronotum, dorsal view **36** fore wing **37** clypeus **38** body, dorsal view **39** mesosoma and propodeum, dorsal view.



**Material examined. Holotype:** SWEDEN • ♀; “Sm. Oskarshamn Virkvarn 17/7.1961 K.J. Hedqvist”, “*Ernobius mollis*”, “HOLOTYPUS *Sigynia* gen.n. *ernobii* sp.n. ♀ K-J Hedqvist det. 1973”, “Examined by Z. Bouček, 1980”, “NHRS-HEVA 000002244”; deposited in NHRS.

**Additional material.** REPUBLIC OF KOREA • 1 ♀; **Gyeongsangnam-do**, Geochang-gun, Namsang-myeon, Jeoncheok-ri, 35°37'15.3"N, 127°57'51.4"E, reared from *Cryphalus fulvus* Niisima on *Pinus densiflora* Siebold & Zucc., 22.VI.2023, coll. E. Tselikh, S. Belokobylskij and J. Lee; (NIBR).

**Distribution.** Czech Republic, Republic of Korea (new record), Sweden, (Hedqvist 1974; Bouček and Rasplus 1991).

**Biology.** Primary parasitoid of the beetle *Ernobius mollis* (Linnaeus, 1758) (Anobiidae) (Hedqvist 1974). The bark beetle *Cryphalus fulvus* Niisima is reported as its host for the first time.

## Acknowledgements

Authors very thankful to Dr. Andrew Polaszek (Principal Researcher at Natural History Museum, London) for the valuable comments of the manuscript.

This work was supported by a grant from the National Institute of Biological Resources (NIBR), funded by the Ministry of Environment (MOE) of the Republic of Korea (NIBR202304203, NIBR202402202, NIBR202502202), and it was partially funded by Russian State Research (project No. 125012901042-9) for EVT and SAB.

## References

- Beaver RA, Liu LY (2010) An annotated synopsis of Taiwanese bark and ambrosia beetles, with new synonymy, new combinations and new records (Coleoptera: Curculionidae: Scolytinae). *Zootaxa* 2602(1): 1–47. <https://doi.org/10.11646/zootaxa.2602.1.1>
- Belokobylskij SA (2009) The genus *Ecphylus* Foerster (Hymenoptera, Braconidae, Doryctinae) in Japan. *Zoosystematica Rossica* 18(1): 83–98. <https://doi.org/10.31610/zsr/2009.18.1.83>
- Belokobylskij SA, Lin Ch-Sh (2020) A new species of the genus *Ecphylus* (Hymenoptera: Braconidae: Doryctinae) from Taiwan, with a diagnostic character previously unknown in the genus. *Zoosystematica Rossica* 29(1): 23–32. <https://doi.org/10.31610/zsr/2020.29.1.23>
- Belokobylskij SA, Ku D-S, Lee H-R, Kwon G-M (2024) Braconidae: Rhyssalinae and Doryctinae. *Arthropoda: Insecta: Hymenoptera. Insect Fauna of Korea* 13(16): 1–513.
- Bouček Z (1965) Studies of European Eulophidae, IV: *Pediobius* Walk. and two allied genera (Hymenoptera). *Acta Entomologica Musei Nationalis Pragae* 36: 5–90.
- Bouček Z, Rasplus J-Y (1991) Illustrated key to West-Palaearctic genera of Pteromalidae (Hymenoptera: Chalcidoidea). *Institut National de la Recherche Agronomique, Paris*, 140 pp.
- Burks R, Mitroiu M-D, Fusu L, Heraty JM, Janšta P, Heydon S, Papilloud ND-S, Peters RS, Tselikh EV, Woolley JB, van Noort S, Baur H, Cruaud A, Darling C, Haas M, Hanson P, Krogmann L, Rasplus J-Y (2022) From hell's heart I stab at thee! A determined approach



- towards a monophyletic Pteromalidae and reclassification of Chalcidoidea (Hymenoptera). *Journal of Hymenoptera Research* 94: 13–88. <https://doi.org/10.3897/jhr.94.94263>
- Gibson G (1997) Morphology and terminology. In: Gibson GAP, Huber JT, Woolley JB (Eds) *Annotated Keys to the Genera of Nearctic Chalcidoidea (Hymenoptera)*. NRC Research Press, Ottawa, 16–44.
- Graham MWR de V (1987) A reclassification of the European Tetrastichinae (Hymenoptera: Eulophidae), with a revision of certain genera. *Bulletin of the British Museum* 55(1): 1–392.
- Hedqvist KJ (1974) Notes on Chalcidoidea (Hym.). IV. Two new genera and species of Pteromalidae from Sweden. *Entomologisk Tidskrift* 95: 53–57.
- Kamijo K (1979) Eulophidae (Hymenoptera) from Korea, with descriptions of two new species. *Annales Historico–Naturales Musei Nationalis Hungarici* 71: 251–264.
- Kamijo K (1981) Pteromalid parasites (Hymenoptera) of bark beetles from Japan, with descriptions of three new species. *Kontyû* 49: 86–95.
- Kono H, Watanabe Ch (1935) A new braconid-parasite of the bark-boring beetle, *Cryphalus piceus* Eggers. *Insecta Matsumurana* 10(1–2): 67–69.
- Kosheleva OV (2023) Eulophid wasps of the subfamily Entedoninae (Hymenoptera: Chalcidoidea) from the Khingan Reserve, Amur Province, Russia. *Far Eastern Entomologist* 479: 13–24. <https://doi.org/10.25221/fee.479.3>
- Ratzeburg JTC (1844) Die Ichneumoniden der Forstinsecten in forstlicher und entomologischer Beziehung. Ein Anhang zur Abbildung und Beschreibung der Forstinsecten. In der Nicolaischen Buchhandlung, Berlin, 224 pp. <https://doi.org/10.5962/bhl.title.11094>
- Tselikh EV (2010) Chalcids of the subfamily Pteromalinae (Hymenoptera, Pteromalidae) as parasitoids of the bark beetles (Coleoptera, Scolytidae) in the fauna of Russia and adjacent territories. *Entomological Review* 90(7): 927–945. <https://doi.org/10.1134/S0013873810070092>
- Tselikh EV (2019) 38. Family Pteromalidae. In: Belokobylskij SA, Samartsev KG, Il'inskaya AS (Eds) *Annotated Catalogue of the Hymenoptera of Russia* 2: 83–111.
- UCD Community (2025) Universal Chalcidoidea Database (UCD) curated in TaxonWorks. <https://ucd.chalcid.org/#/> [accessed on 6 March 2025]
- Walker F (1834) *Monographia Chalciditum*. [Continued.] *Entomological Magazine* 2(2): 148–179.
- Watanabe Ch (1948) On three species of Braconidae bred from some beetles (Hymenoptera). *Mushi* 18(15): 95–99.